VPCLS2

User Manual

Revision 1.03

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Introduction 1

Profichip offers several ASICs for all types of PROFIBUS applications.

There are plain devices in the automation engineering area, such as switches or simple actuators that do not require a microcontroller for data preprocessing. Profichip's **VPCLS2** is a DP-Slave ASIC with 32 direct input/output bits that fits very well for this kind of applications. The VPCLS2 handles the entire data transfer independently. No additional microprocessor or firmware is necessary. The VPCLS2 is compatible with existing chips.

The **VPC3+** is based directly on Layer 1 and Layer 2 of the OSI Model and requires an additional microprocessor for implementation of Layer 7. This permits all protocol types to be covered at user side. The VPC3+ supports passive users on the bus system and filters off all faulty telegrams and telegrams with deviant station address.

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1 Introduction

Notes:

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2.1 Overview

Figure 2-1 illustrates a simplified block diagram of the VPCLS2. Each function block is briefly explained. For more detailed information about the submodules, please refer to subsequent sections.

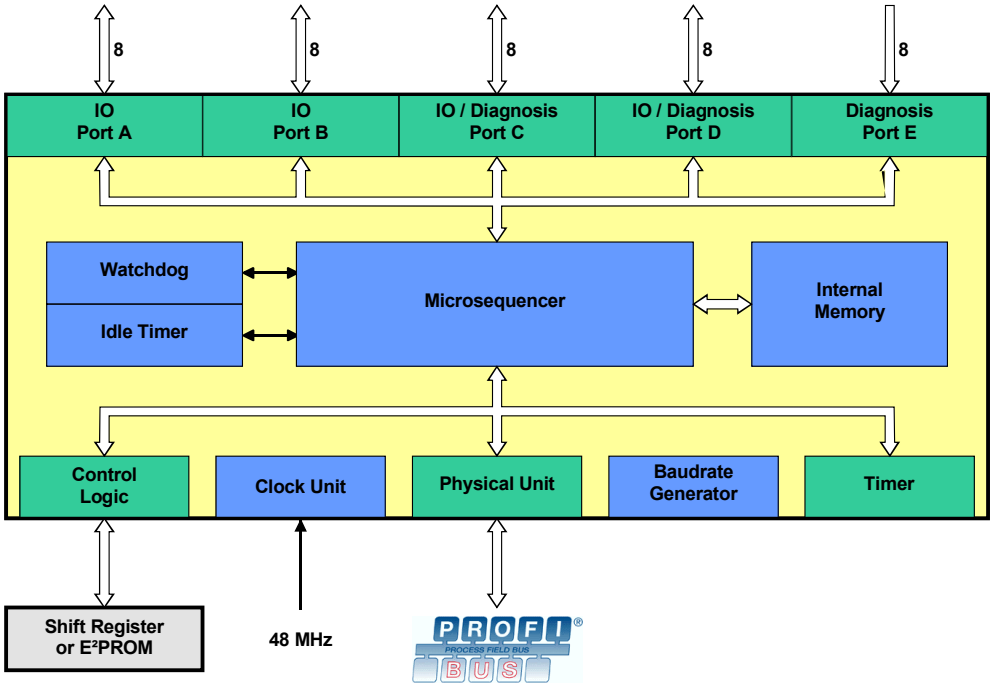

Figure 2-1 : Blockdiagram of VPCLS2

The **VPCLS2** has input/output ports, which can be adapted directly for data exchange with the periphery. No external microprocessor or additional software is necessary. The main function blocks of the VPCLS2 include:

The **Physical Unit** converts the parallel internal data of the VPCLS2 to a serial data stream for the PROFIBUS and vice versa.

The **Baud Rate Generator** generates the transmission clock of 9.6 kbit/s up to 12 Mbit/s for the PROFIBUS interface. The data transmission rate is recognized and controlled automatically.

The **IDLE Timer** generates and observes the bus idle time, which is required for synchronizing the bus devices.

The integrated **Watchdog Timer** permanently observes the VPCLS2 for addressability. In case of an error, all data ports are set to a logical '0' in order to avoid malfunctions.

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2 Functional Description

The **I/O Interface** consists of five 8-bit ports. Port A and B are I/O-Ports only, Port C and D can be configured either as I/O- or diagnosis ports and Port E is a pure diagnosis port. That is, the VPCLS2 is able to handle up to 32 bit I/O data. The data ports A to D can be configured as inputs or outputs independent from each other. The interface configuration is set via five pins on the VPCLS2.

The **Microsequencer** carries out the entire PROFIBUS DP protocol handling. Due the total protocol integration in hardware, baudrates up to 12 Mbit/s can be supported without any restrictions.

The PROFIBUS-specific parameters (Station_Address and Ident_Number) may be read from an external shift register or serial E²PROM during power-up and after reset. An integrated **Control Logic** generates the signals for controlling the external serial shift.

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3.1 Pin Assignment

Pin	Signal Name	In/Out	Description	
1	XCTS	I(CS)	Clear To Send	PROFIBUS interface: The VPCLS2 is Clear To Send, if the XCTS signal is active (low)
2	RXD	I(CS)	Receive Data	PROFIBUS interface: input/receive data for VPCLS2
3	RTS	O	Request To Send	The VPCLS2 requests Clear to Send with RTS = '1'
4	TXD	O	Transmit Data	PROFIBUS interface: output/transmit data from VPCLS2
5	GND			
6	PA0	I(CS) / O	Port A	Port A can be configured as data input or data output port, depending on the setting of the type pins TYP0..4 (see I/O Interface Configuration Table)
7	PA1			
8	PA2			
9	PA3			
10	PA4			
11	PA5			
12	GND			
13	PA6	I(CS) / O	Port A	
14	PA7			
15	VCC			
16	PB0	I(CS) / O	Port B	Port B can be configured as data input or data output port, depending on the setting of the type pins TYP0..4 (see I/O Interface Configuration Table)
17	PB1			
18	PB2			
19	PB3			
20	PB4			
21	PB5			
22	PB6			
23	PB7			
24	GND			
25	VCC			
26	PE0	I(CS)	Port E	The VPCLS2 receives diagnosis information for the configurable data ports or user-specific diagnostic data via this port
27	PE1			
28	PE2			
29	PE3			
30	PE4			
31	PE5			
32	GND			
33	VCC			
34	PE6	I(CS)	Port E	
35	PE7			
36	GND			

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3 Pin Description

Pin	Signal Name	In/Out	Description		
37	PC0	I(CS) / O	Port C	Port C can be configured as data input, data output or diagnosis port, depending on the setting of the type pins TYP0..4 (see I/O Interface Configuration Table)	
38	PC1				
39	PC2				
40	PC3				
41	PC4				
42	PC5				
43	PC6				
44	PC7				
45	VCC				
46	PD0	I(CS) / O	Port D	Port D can be configured as data input, data output or diagnosis port, depending on the setting of the type pins TYP0..4 (see I/O Interface Configuration Table)	
47	PD1				
48	PD2				
49	PD3				
50	PD4				
51	PD5				
52	GND				
53	PD6	I(CS) / O	Port D		
54	PD7				
55	VCC				
56	XRESET	I(CS)	asynchronous RESET	Resets the VPCLS2 to a defined initial state (low active)	
57	RWCONS	O	Read Write CONSistency	Output 'Read or Write Consistent', signal for "preindicating" a subsequent write or read operation on the data ports.	
58	XTEMO	I(C)	TEst MOde	Test pin: must be set to '1' during normal operation	
59	XTRI	I(C)	TRI-state	Test pin: must be set to '1' during normal operation	
60	XSREE	I(C)	Shift Register / EEprom select	Defines whether an external shift register or serial E²PROM is connected to the VPCLS2	'1' = ext. E²PROM '0' = ext. shift register
61	NC			Not Connected	
62	DIAERROR	O	DIAGnosis ERROR	This output is set when external diagnosis occurs	
63	NORMOPER	O	NORMal OPERation	Operating state indicator	'1' = normal operation (DATA-EXCH state) '0' = after reset and after each timeout of the WD timer
64	GND				
65	TYP0	I(C)	TYPe 0..4	Ports A..D of the VPCLS2 are configured with these pins (see I/O Interface Configuration Table for details).	
66	TYP1	I(C)			
67	TYP2	I(C)			
68	TYP3	I(C)			
69	TYP4	I(C)			
70	GND				
71	NC			Not Connected	
72	CLK	I(TS)	CLocK	System Clock Input 48 MHz	
73	VCC				

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Pin	Signal Name	In/Out	Description	
74	GND			
75	ACA	I(C)	Address Change Allowed	When ACA signal is '1', it is possible, to overwrite the E²PROM contents by a Set_Slave_Add telegram even if the Real_No_Add_Chg bit is '1'.
76	INTERCLK	O	INTERface CLocK	VPCLS2 generates clock sequences for the external shift register / E²PROM via this signal.
77	INTERCS	O	INTERface Chip Select	VPCLS2 selects the external shift register / E²PROM via this signal.
78	INTERDI	I(TS)	INTERface Data Input	VPCLS2 receives input data from the external shift register / E²PROM via this signal.
79	INTERDOD	O	INTERface Data OutloaD	This output serves as a parallel load signal for the external shift register or a control signal for E²PROM.
80	VCC			

Table 3-1 : Pin Assignment

Note: All signals beginning with X.. are LOW active.
VCC = +5 V
GND = 0 V

Input Levels:

I (C) : CMOS
I (CS) : CMOS, Schmitt-Trigger
I (TS) : TTL, Schmitt-Trigger

Status of pins TYP0..4, ACA and XSREE may only be changed when the ASIC is without voltage. Dynamical change of those pins while working is not permitted.

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3.2 Pinout

VPCLS2 has a 80-pin PQFP housing with the following pinout:

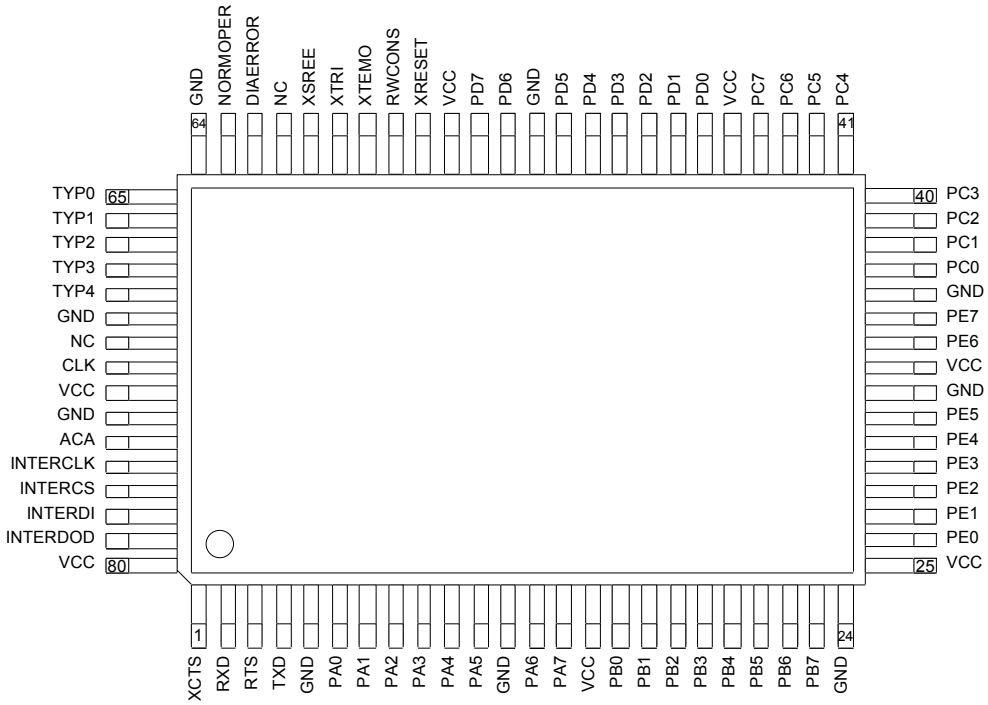

Figure 3-1 : VPCLS2 Pinout

For details about package outline and dimensions see section 8.7 Package.

3.3 Pin Function

3.3.1 CLK

The VPCLS2 needs an external 48 MHz crystal oscillator for proper operation and supports the maximum baud rate of 12 Mbit/s.

3.3.2 RWCONS

This output signal indicates a subsequent consistent write or read access operation on the data ports. For details about the signal timing, please refer to section 8.6.4 Consistency Signal RWCONS.

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3.3.3 ACA

With ACA signal active (high), it is possible to overwrite the external E²PROM contents by a Set_Slave_Add telegram even if the bit Real_No_Add_Chg is set (see chapter 5 PROFIBUS DP Interface).

Value	Function
0	current Station_Address cannot be changed in the E²PROM if Real_No_Add_Chg is set
1	current Station_Address can be changed in the E²PROM even if Real_No_Add_Chg is set

Table 3-2: Coding of ACA

If the VPCLS2 is operated with an external shift register, this input has no function.

This input must not be left unconnected.

After power-on it's always possible to overwrite the address once.

3.3.4 XSREE

This input indicates whether the VPCLS2 is operated with an external shift register or external serial E²PROM.

Value	Function
0	external shift register is used
1	external serial E²PROM is used

Table 3-3: Coding of XSREE

If XSREE = 0, Station_Address and Ident_Number are read from the external shift register after each reset. If XSREE is ‘0’, the Station_Address cannot be changed by a Set_Slave_Add telegram.
If XSREE = 1, Station_Address and Ident_Number are read from the external E²PROM. Station_Address can be changed by a Set_Slave_Add telegram. In this case the E²PROM contents will be updated with the New_Slave_Add.

If bit No_Add_Chg was set in the Set_Slave_Add service the E²PROM contents can only be changed again if ACA is ‘1’ or after power-on.

This input must not be left unconnected.

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3.3.5 DIAERROR

This output indicates a diagnosis error and can be used to drive a LED. The maximum output current is 4 mA.

Value	Function
0	no diagnosis error pending
1	diagnosis error pending, i.e. a ‘0’ is applied to one of the diagnosis pins

Table 3-4: Coding of DIAERROR

3.3.6 NORMOPER

This output indicates the operating state of the DP-Slave state machine (DP_SM) in the VPCLS2 and can be used to drive a LED. The maximum output current is 4 mA.

Value	Function
0	after reset and after each timeout of the watchdog timer
1	normal operation (DATA-EXCH state)

Table 3-5: Coding of NORMOPER

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4.1 I/O Interface

4.1.1 Port Configuration

The VPCLS2 has 5 user interface ports:

Port	Function
A	8-bit input or output port
B	8-bit input or output port
C	8-bit input, output or channel diagnosis port
D	8-bit input, output or channel diagnosis port
E	8-bit group diagnosis port

Table 4-1: Port Functions

Various I/O configurations can be set via the configuration pins (TYP0..4). Coding of the individual configuration is specified in the table below.

Configuration pins TYP0..4 have to be set before power-up. They may not be changed dynamically during operation.

When using consistency the DP-Master documentation has to be attended!

Unused ports (marked by a dash in the table) are programmed as outputs by default and may be left unconnected on the board. Therefore no external resistors and no pads with internal pull resistors are required.

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TYP Pin					Port Configuration / Consistency Requirement					
4	3	2	1	0	Port A	Port B	Port C	Port D	Port E	Consist.
0	0	0	0	0	IN	-	-	-	Diagnosis	none
0	0	0	0	1	IN	IN	-	-	Diagnosis	none
0	0	0	1	0	IN	IN	IN	-	Diagnosis	none
0	0	0	1	1	IN	IN	IN	IN	Diagnosis	none
0	0	1	0	0	OUT	-	-	-	Diagnosis	none
0	0	1	0	1	OUT	IN	-	-	Diagnosis	none
0	0	1	1	0	OUT	IN	IN	-	Diagnosis	none
0	0	1	1	1	OUT	IN	IN	IN	Diagnosis	none
0	1	0	0	0	OUT	OUT	-	-	Diagnosis	none
0	1	0	0	1	OUT	OUT	IN	-	Diagnosis	none
0	1	0	1	0	OUT	OUT	IN	IN	Diagnosis	none
0	1	0	1	1	-	-	-	-	Diagnosis	none
0	1	1	0	0	OUT	OUT	OUT	-	Diagnosis	none
0	1	1	0	1	OUT	OUT	OUT	IN	Diagnosis	none
0	1	1	1	0	-	-	-	-	Diagnosis	none
0	1	1	1	1	OUT	OUT	OUT	OUT	Diagnosis	none
1	0	1	0	1	IN	IN	-	-	Diagnosis	overall
1	0	1	1	0	IN	IN	IN	IN	Diagnosis	overall
1	0	1	1	1	OUT	OUT	-	-	Diagnosis	overall
1	1	0	0	0	OUT	OUT	OUT	OUT	Diagnosis	overall
1	1	0	0	1	OUT	OUT	IN	IN	Diagnosis	overall
1	1	1	0	0	IN	IN	IN	-	Diagnosis	overall
1	1	1	0	1	OUT	OUT	OUT	-	Diagnosis	overall
1	1	1	1	0	OUT	OUT	OUT	IN	Diagnosis	overall
1	1	1	1	1	OUT	IN	IN	IN	Diagnosis	overall
Extended Diagnosis:										
1	0	0	0	0	IN	-	Diagnosis	-	Diagnosis	none
1	0	0	0	1	IN	IN	Diagnosis	Diagnosis	Diagnosis	none
1	0	0	1	0	OUT	-	Diagnosis	-	Diagnosis	none
1	0	0	1	1	OUT	OUT	Diagnosis	Diagnosis	Diagnosis	none
1	0	1	0	0	OUT	IN	Diagnosis	Diagnosis	Diagnosis	none
1	1	0	1	0	IN	IN	Diagnosis	Diagnosis	Diagnosis	overall
1	1	0	1	1	OUT	OUT	Diagnosis	Diagnosis	Diagnosis	overall

Table 4-2 : I/O Interface Configuration

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4.1.2 Diagnosis ports

The VPCLS2 offers a maximum of three diagnosis ports depending on the port configuration. Port E is always a diagnosis port while Ports C and D are only diagnosis ports if extended diagnosis is selected via the configuration. Port C and D are then used for channel diagnosis.

Generally, all diagnosis ports are low active. A ‘0’ at a diagnosis pin is recognized as a pending diagnosis error.

The user can use all diagnosis ports for user-specific diagnosis. A ‘0’ at a diagnosis input corresponds to a diagnosis error and sets the VPCLS2 output pin DIAERROR to ‘1’. Output DIAERROR remains set until an error level is no longer applied to the diagnosis ports. The pin can be used to drive an LED. The driver power of the output is 4 mA.

The group diagnosis port (Port E) is available as a user-specific diagnosis port with 8 bits in any configuration. Two operating modes are basically possible for this port, which can be set by the user with the flag En_Sammel_Dia in the Set_Prm telegram.

En_Sammel_Dia:	
‘0’	A ‘0’ at a pin of Port E leads to a diagnosis error (DIAERROR output is set to ‘1’)
‘1’	A ‘0’ at pins 0 to 3 of Port E leads only to a diagnosis error if a channel diagnosis error is also pending at any pin of Port C or Port D. A ‘0’ at pins 4 to 7 of Port E always leads to a diagnosis error (regardless of Ports C and D).

Table 4-3: Coding of En_Sammel_Dia

If a port configuration without channel diagnosis (Port C and D) is selected, En_Sammel_Dia must be set to ‘0’.

If configured via the pins TYP0..4, the VPCLS2 also has two channel diagnosis ports (Ports C and D) which can be used to observe each of the remaining I/O ports (Ports A and B). If ports C and D are configured as diagnosis ports, a ‘0’ at one of the pins always leads to a diagnosis error and DIAERROR is set to ‘1’.

The channel diagnosis ports can also be masked channel-by-channel (each bit) via mask registers in the Set_Prm telegram. After a reset, all masks are inactive. An error (‘0’) at a channel diagnosis pin is forwarded only if the corresponding mask bit is equal to zero.

In order to prevent unconnected inputs of external diagnosis hardware from leading to a permanent diagnosis error, the VPCLS2 has an internal compare logic. It compares the current diagnosis data with the data last read in and generates an error only if a diagnosis change has occurred, that is,

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each change is sent to the DP-Master only once (highprior Data_Exchange response telegram).

‘1’ (+5V) must be applied via pull-up resistors to all unused inputs of the group diagnosis port (Port E) and all unused inputs of the I/O ports configured as a channel diagnosis port.

4.2 Shift Register Interface

The VPCLS2 can be connected to an external shift register (XSREE = 0) containing the Station_Address and Ident_Number. In this case, the integrated control logic generates control sequences for shift registers like the 74HC165 or compatible devices automatically.

4.2.1 Shift Register Control Logic

The shift register control logic is a submodule which is triggered once after each reset in order to shift in the Ident_Number and Station_Address from the external shift register.

Signal Name	O	Function	Status after reset
INTERCLK	O	Clock Signal for Shift Register	‘0’
INTERCS	O	Chip-Select for Shift Register	‘1’
INTERDI	I	Data In	-
INTERDOD	O	Data Out (Shift Register Parallel Load)	‘1’

Table 4-4 : Signals of the Shift Register Interface

The control logic generates a clock signal (INTERCLK), a clock enable signal (INTERCS) and a parallel load signal (INTERDOD) for the external shift register with the required timing.

When reading, the data is first loaded parallel into the external shift register with the INTERDOD signal. From there, the data is clocked serially into the VPCLS2 internal shift register (see section 'Timing' for detail about the timing).

The shift register controller operates with a clock frequency of 250 kHz. A read access operation lasts 96 µs.

4.2.2 Shift Register Parameters

The internal shift register of the VPCLS2 is written serially beginning with bit position 23. Data bits are shifted one position to the right by each clock pulse.

The required serial data sequence at input INTERDI is shown in Figure 4-1. First bit to be read is bit 0 of the Station_Address.

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Please note that the Station_Address is read BCD-coded, thus permitting values between 1 and 99.

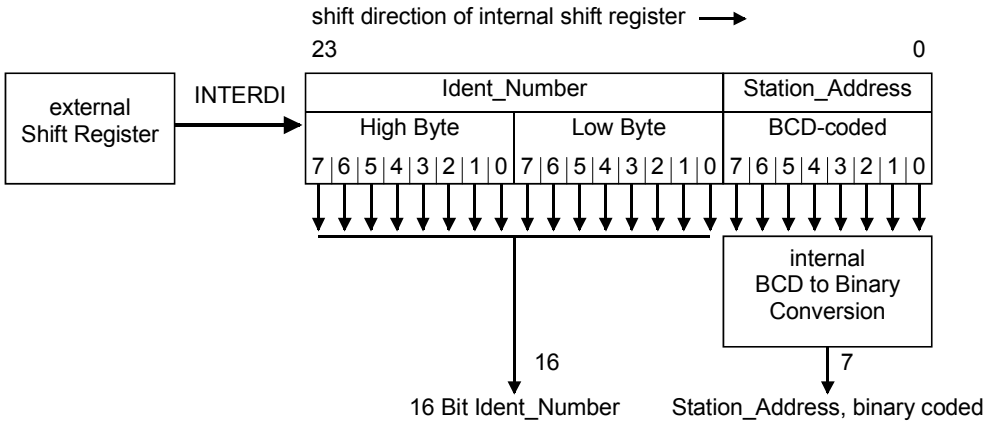

Figure 4-1 : Shift Register Data Sequence

A total of 24 bits must be stored in the external shift register: 16 bits for the Ident_Number and 8 bits for the Station_Address.

The Station_Address must be set BCD-coded (values 1 to 99 are permitted). If the VPCLS2 reads the value 0, the Station_Address is assigned the default address 126.

The BCD-coded external address is converted to binary format inside the VPCLS2 in order to permit the Station_Address to be compared with the binary-coded destination address (DA) of the PROFIBUS telegrams.

4.3 E²PROM Interface

The VPCLS2 can be connected to an external serial E²PROM (XSREE=1) with 5V supply, containing the Station_Address and Ident_Number. In this case, the integrated control logic generates control sequences for E²PROM like the 93C46 or compatible devices automatically. The device must have a 16-bit organization and a MICROWIRE compatible interface.

4.3.1 E²PROM Control Logic

The E²PROM control logic is a submodule which is triggered after each reset in order to shift in the Ident_Number and Station_Address from the external E²PROM. If a valid Set_Slave_Add telegram is received the VPCLS2 will program the New_Slave_Add and the new No_Add_Chg bit into the E²PROM automatically. The program cycle will be verified by comparing the actual contents of the E²PROM with the expected values. If programming the E²PROM fails the VPCLS2 reloads the default Station_Address 126 and proceeds operation with that address. The Ident_Number cannot be changed by a Set_Slave_Add telegram.

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As long as the VPCLS2 is programmed no other Set_Slave_Add service will be processed by the VPCLS2. These telegrams are responded with “no resource” (RR). While the E²PROM write cycle is in progress, bit Diag.E²PROM_Prg_Active is set to ‘1’ in the diagnosis response. If the control logic can’t program the E²PROM without an Error, bit Diag.E²PROM_ Fault is set to ‘1’ in the diagnosis response.

If the No_Add_Chg bit was set in the Set_Slave_Add telegram then changing the Station_Address afterwards is only possible if ACA is ‘1’. After power-on it's always possible to overwrite the Station_Address at least once.

Signal Name	O	Function	Status after reset
INTERCLK	O	Clock Signal for E²PROM	‘0’
INTERCS	O	Chip-Select for E²PROM	‘0’
INTERDI	I	Data In	-
INTERDOD	O	Data Out	‘1’

Table 4-5: Signals of the E²PROM Interface

The control logic generates a clock signal (INTERCLK), a clock enable signal (INTERCS) and a data write signal (INTERDOD) for the external device with the required timing. Via the data read signal (INTERDI) the VPCLS2 reads in sequentially the data from E²PROM.

Since the memory has a serial interface, the data, addresses and also the commands must be transferred serially. Each sequence consist of a Startbit, a 2-bit Opcode and a 6-bit address. Data is read or written only after such sequence. Each write cycle is preceded by an erase/write enable cycle.

Command	Startbit 8	Opcode 7..6	Address 5..0	Data	Function
READ	1	10	000000		read data of address 0
READ	1	10	000001		read data of address 1
EWEN	1	00	110000		erase / write enable
WRITE	1	01	000000	D15..D0	Write data to address 0

Table 4-6: Sequences used for communication with serial E²PROM

The E²PROM controller operates with a clock frequency of 250 kHz. A read access operation lasts 200 µs and a write access up to 10 ms.

A reset during a write cycle results in undefined E²PROM data.

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4.3.2 E²PROM Parameters

Only the first two 16-bit words are used. The addresses 0 and 1 are read but only the 16-bit word at address 0 is written.

The Ident_Number has to be be written to the E²PROM before connecting to VPCLS2 since only the Station_Address can be changed by a VPCLS2 write access.

Byte	Bit Position															
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	0	0	0	0	0	0	0	0	Real_No_Add_Chg	Station_Address						
1	Ident_Number															

Table 4-7: Coding of E²PROM

After power-on the VPCLS2 reads the two words serially form E²PROM and loads them into its internal registers. Always the MSB is read first. The Station_Address must have a value in the range of 1..126. All other values (0 and 127) results to operation with default address 126. The default values (Station_Address = 126, Real_No_Add_Chg = 0) are also stored into E²PROM.

4.4 Watchdog Timer

If malfunctions or disturbances occur on the Profibus line, the VPCLS2 might no longer receive valid telegrams and, thus, the module's ports can no longer be operated. In order to detect this situation a Watchdog Timer has been integrated. In addition the Watchdog Timer is used for automatic baud rate detection after reset or after the baud rate has been lost during operation.

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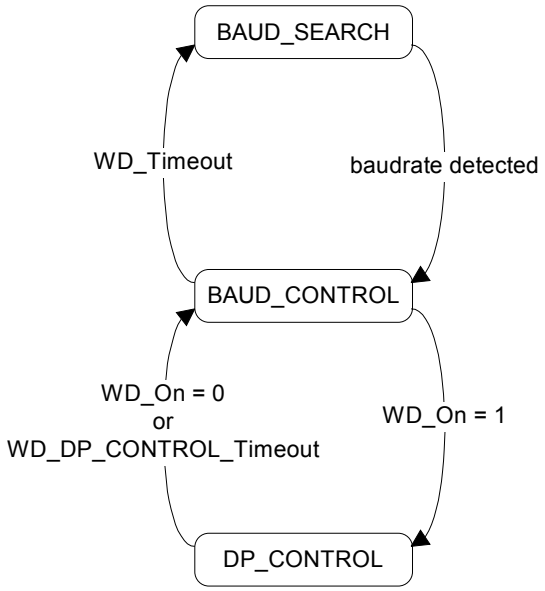

Figure 4-2: Watchdog State Machine (WD_SM)

4.4.1 Automatic Baud Rate Detection

The VPCLS2 is capable of detecting the baud rate automatically. VPCLS2 starts to search for the current transmission rate using the highest baud rate. If no SD1, SD2 or SD3 telegram was received completely and without errors during the monitoring time, the VPCLS2 branches to the next lower baud rate.

After identifying the correct baud rate, the VPCLS2 switches to the BAUD_CONTROL state and observes the baud rate. Each telegram to its own Station_Address received with no errors resets the Watchdog. If the timer expires, the VPCLS2 switches to the BAUD_SEARCH state again.

After an invalid configuration or if the UNLOCK bit in the Set_Prm telegram is set, the DP_SM returns to state WAIT-PRM, but WD_SM does not go to state BAUD_SEARCH any more. This could cause problems if the master changes the baud rate at that time.

4.4.2 Baud Rate Monitoring

The detected baud rate is permanently monitored in BAUD_CONTROL. The Watchdog is triggered by each error-free telegram to its own Station_Address. If a timeout occurs, that is, no valid telegram could be detected within the watchdog period, all outputs are cleared (‘0’) and the WD_SM automatically branches to the automatic baud rate detection state (BAUD_SEARCH). The watchdog is used for the DP_CONTROL state, after a Set_Prm telegram was received with an enabled response time monitoring (WD_On = 1). The watchdog timer remains in the baud rate monitoring state when the master monitoring is disabled (WD_On = 0). The DP_SM is not reset when the timer expires in the state BAUD_CONTROL. That is, the DP-Slave remains in the DATA-EXCH state, for example.

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4.4.3 Response Time Monitoring

The DP_CONTROL state serves as the response time monitoring of the DP-Master (Diag_Master_Add). The used monitoring time results from multiplying both watchdog factors and then multiplying this result with the time base (1 ms or 10 ms):

T_{WD} = WD_Base × WD_Fact_1 × WD_Fact_2
(see byte 7 of the Set_Prm telegram.)

The user can load the two watchdog factors (WD_Fact_1 and WD_Fact_2) and the time base that represents a measurement for the monitoring time via the Set_Prm telegram with any value between 1 and 255. A monitoring time between 2 ms and 650 s - independent of the baud rate - can be implemented with the permitted watchdog factors.

Setting WD_1 = 1 and WD_2 = 1 is not permitted.

In addition, neither WD_1 nor WD_2 may be set to 0.

If the monitoring time expires, the VPCLS2 goes to BAUD_CONTROL state again. If another DP-Master takes over the VPCLS2, the Watchdog State Machine either branches to BAUD_CONTROL (WD_On = 0) or to DP_CONTROL (WD_On = 1).

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Notes:

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The VPCLS2 is a DP-Slave. Response telegrams are generated independently by the VPCLS2 if a valid request telegram is detected to its own Station_Address.

The VPCLS2 only processes valid SD1 or SD2 telegrams addressed to its own Station_Address. Other telegrams are disregarded. During baud rate detection mode VPCLS2 uses all telegrams (including SD3 and SD4 telegrams) to find the correct baud rate.

This section only describes those aspects of certain DP telegrams that are relevant for using with the VPCLS2. For a detailed description of all telegrams, please refer to the PROFIBUS standard IEC 61158-6.

An example GSD-file is given in the appendix.

5.1 Set_Prm (SAP 61)

The DP-Master transfers parameter data to the VPCLS2 by means of the Set_Prm telegram (Table 5-1). Bytes 0 to 6 are the standard parameter bytes according to PROFIBUS standard IEC 61158-6. In addition the VPCLS2 specific parameter bytes 7 to 11 have to be transferred by the DP-Master.

Byte	Bit Position								Designation
	7	6	5	4	3	2	1	0	
0	Lock_ Req	Unlock_ Req	Sync_ Req	Freeze_ Req	WD_On	Reserved	Reserved	Reserved	Station Status
1									WD_Fact_1
2									WD_Fact_2
3									$minT_{SDR}$
4									Ident_Number_High
5									Ident_Number_Low
6									Group_Ident
7	0	0	0	0	En_Sammel_ Dia	WD_Base	Dis_Stop_ Control	Dis_Start_ Control	User_Def_PRM1
8									Mask_Diaport_C
9									Mask_Diaport_D
10	0	0	0	0	0	0	0	0	Reserved1
11	0	0	0	0	0	0	0	0	Reserved2

Table 5-1 : Format of the Set_Prm Telegram

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Bits in the Set_Prm telegram marked with ‘0’ are not checked by the VPCLS2.

5.1.1 User_Def_PRM1

	User_Def_PRM1:
bit 7-4	**Reserved:** To be parameterized with ‘0’
bit 3	**Diagnosis (En_Sammel_Dia):** Activates the group diagnosis mode 0 = A ‘0’ at a pin of Port E leads to a diagnosis error (DIAERROR output is set to ‘1’) 1 = A ‘0’ at pins 0 to 3 of Port E leads only to a diagnosis error if a channel diagnosis error is also pending at any pin of Port C or Port D. A ‘0’ at pins 4 to 7 of Port E always leads to a diagnosis error (regardless of Ports C and D).
bit 2	**WD_Base:** Watchdog Time Base 0 = Watchdog time base is 10 ms (default state) 1 = Watchdog time base is 1 ms
bit 1	**Dis_Stop_Control:** Disable Stop-Bit Control 0 = Stop-Bit monitoring in the receiver is enabled (default state) 1 = Stop-Bit monitoring in the receiver is disabled
bit 0	**Dis_Start_Control:** Disable Start-Bit Control 0 = Start-Bit monitoring in the receiver is enabled (default state) 1 = Start-Bit monitoring in the receiver is disabled

Table 5-2 : User_Def_Prm1

If a port configuration without channel diagnosis (port C and D) is selected, En_Sammel_Dia must be set to ‘0’.

5.1.2 Mask_Diaport_C/D

Bytes 8 and 9 of the Set_Prm telegram contain the mask bits for the channel diagnosis ports C and D.

Mask_Diaport_C contains the mask bits for diagnosis Port C and Mask_Diaport_D contains the mask bits for diagnosis Port D. The mask bits are assigned to the corresponding bit positions of the channel diagnosis ports. A ‘1’ at the corresponding bit position disables diagnosis, that is, an error at that pin will not be forwarded to the master. After Reset all masks are cleared (‘0’).

If a port configuration without channel diagnosis is selected, both mask bytes must be set to 00H.

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5.1.3 Reserved1/2

These bytes are currently not used and must be programmed as 00H.

5.2 Slave_Diag (SAP 60)

The VPCLS2 sends diagnosis data to the DP-Master by means of this telegram (Table 5-3). In addition to the standard diagnosis bytes 0 to 5, the VPCLS2 supports 7 bytes of external diagnosis. Diagnosis data is transferred only after a change of the pending data (except for the Freeze_Mode). A '1' at a bit position indicates that the corresponding event has occurred.

If Freeze_Mode is activated, the diagnosis data is also frozen. A telegram is thus sent to the DP-Master, but it will contain no change of the diagnosis data. Diagnosis data will not be updated before another 'Freeze' occurred.

Byte	Bit Position								Designation
	7	6	5	4	3	2	1	0	
0									Station_Status_1
1									Station_Status_2
2									Station_Status_3
3									Diag_Master_Add
4									Ident_Number_High
5									Ident_Number_Low
6	0	0	0	0	0	1	1	1	Diag_Header
7	PE7	PE6	PE5	PE4	PE3	PE2	PE1	PE0	Group diagnosis (Port E)
8	0	0	0	0	0	0	0	0	Diag_Reserved_1
9	PC7	PC6	PC5	PC4	PC3	PC2	PC1	PC0	Port C (only with extended diagnosis, otherwise 00H)
10	PD7	PD6	PD5	PD4	PD3	PD2	PD1	PD0	Port D (only with extended diagnosis, otherwise 00H)
11	0	0	0	0	0	0	0	0	Diag_Reserved_2
12	Diag.E²PROM_Fault	Diag.E²PROM_Prg_Active	0	0	0	0	0	0	Diag_E²PROM

Table 5-3 : Format of the Slave_Diag Telegram

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Byte 0 – 5:
Bytes 0 to 5 contain the standard Slave_Diag telegram header (refer to IEC 61158-6 for details).

Byte 6: Diag_Header
This byte indicates the number of external diagnosis bytes. This byte is set to 07H for the VPCLS2.

Byte 7: Group diagnosis
This byte contains the diagnosis data of the signals pending at Port E. A diagnosis error (‘0’) at a pin of Port E is inverted and forwarded to the master as a ‘1’ at the corresponding bit position.

Byte 8, 11: Diag_Reserved_1/2
These bytes are reserved. The VPCLS2 always transmits a value of 00H for those bytes.

Byte 9, 10: Channel diagnosis Port C, Port D
These bytes contain the diagnosis data of the signals pending at Port C and Port D. A diagnosis error (‘0’) at one of the pins is inverted and forwarded to the master as a ‘1’ at the corresponding bit position. If no extended diagnosis is set via the port configuration, a value of 00H is sent by the VPCLS2 for those bytes.

Byte 12: Diag_E²PROM:
If the E²PROM write cycle had not been successfully finished, this is, Slave_Address have not been written without faults, the bit Diag.E²PROM_Fault is set to ‘1’.
If the E²PROM write cycle is in progress, bit Diag.E²PROM_Prg_Active is set to ‘1’.

5.3 Chk_Cfg (SAP 62)

The DP-Master transfers the configuration data to the VPCLS2 by means of this telegram. The VPCLS2 expects 2 bytes of configuration data. The following order must be kept:

Byte	Bit Position								Designation
	7	6	5	4	3	2	1	0	
0	0/1	0	1	0	0	0	0/1	0/1	Code Byte Outputs
1	0/1	0	0	1	0	0	0/1	0/1	Code Byte Inputs

Table 5-4 : Chk_Cfg Telegram

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Number of outputs	Without consistency	Overall consistency
1	20H	A0H
2	21H	A1H
3	22H	A2H
4	23H	A3H
0	00H	00H

Table 5-5: Coding of Code Byte Outputs

Number of inputs	Without consistency	Overall consistency
1	10H	90H
2	11H	91H
3	12H	92H
4	13H	93H
0	00H	00H

Table 5-6: Coding of Code Byte Inputs

5.4 Global_Control (SAP 58)

The VPCLS2 supports Sync_Mode and Freeze_Mode, i.e. if a Sync Command or Freeze Command is set in the Global_Control telegram, the corresponding function is executed (refer to PROFIBUS standard IEC 61158-6 for more details).

If Freeze_Mode is activated, the diagnosis data is also frozen. A Slave_Diag response telegram is thus sent to the DP-Master, but it will contain no change of the diagnosis data. Diagnosis data will not be updated before another Freeze Command occurred.

5.5 Set_Slave_Add (SAP 55)

The Set_Slave_Add service is only supported in E²PROM mode. If using an external shift register, this service will be acknowledged negative. The permitted address range is 0 to 125.

If a valid Set_Slave_Add telegram is received the VPCLS2 will program the New_Slave_Add and the new No_Add_Chg bit into the E²PROM automatically. The program cycle will be verified by comparing the actual contents of the E²PROM with the expected values.

If programming of the E²PROM fails the VPCLS2 reloads the default PROFIBUS address (126) and proceeds operation with that address. An E²PROM programming fault is indicated in the diagnosis response with bit Diag.E²PROM_Fault set to ‘1’.

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As long as the E²PROM is programmed no other Set_Slave_Add service will be processed by the VPCLS2. While the E²PROM Memory write cycle is in progress, bit Diag.E²PROM_Prg_Active is set to '1' in the diagnosis response.

If the No_Add_Chg bit was set in the Set_Slave_Add telegram then changing the Station_Address afterwards is only possible if ACA is '1'. After power-on it's always possible to overwrite the slave address at least once.

5.6 Other Services (SAP 56, 57, 59)

In addition the VPCLS2 supports the following PROFIBUS services:

- RD_Input (SAP 56)
- RD_Output (SAP 57)
- Get_Cfg (SAP 59)

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6.1 Shift Register Interface

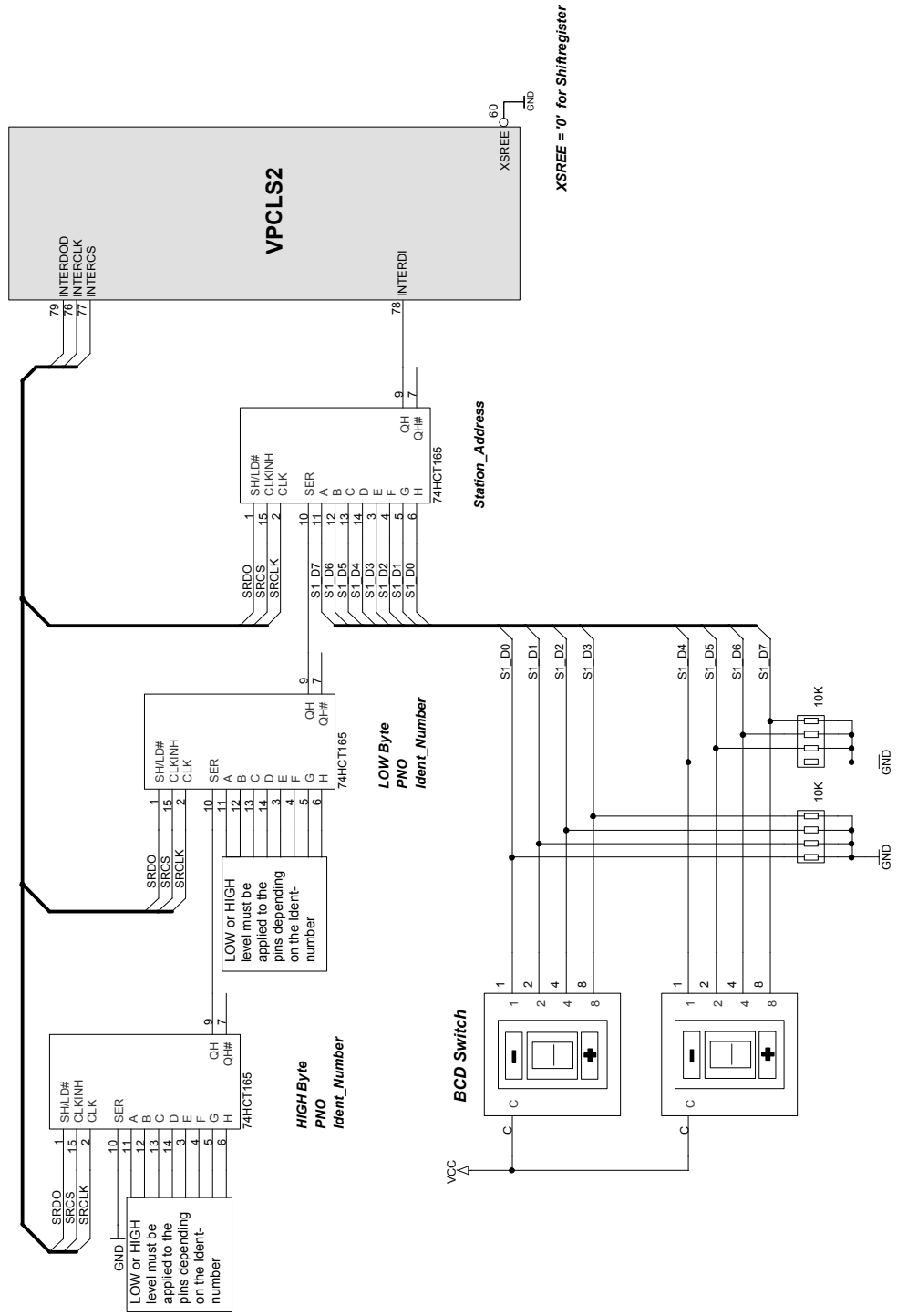

Figure 6-1: Shift Register Example

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6.2 E²PROM, LEDs and Reset

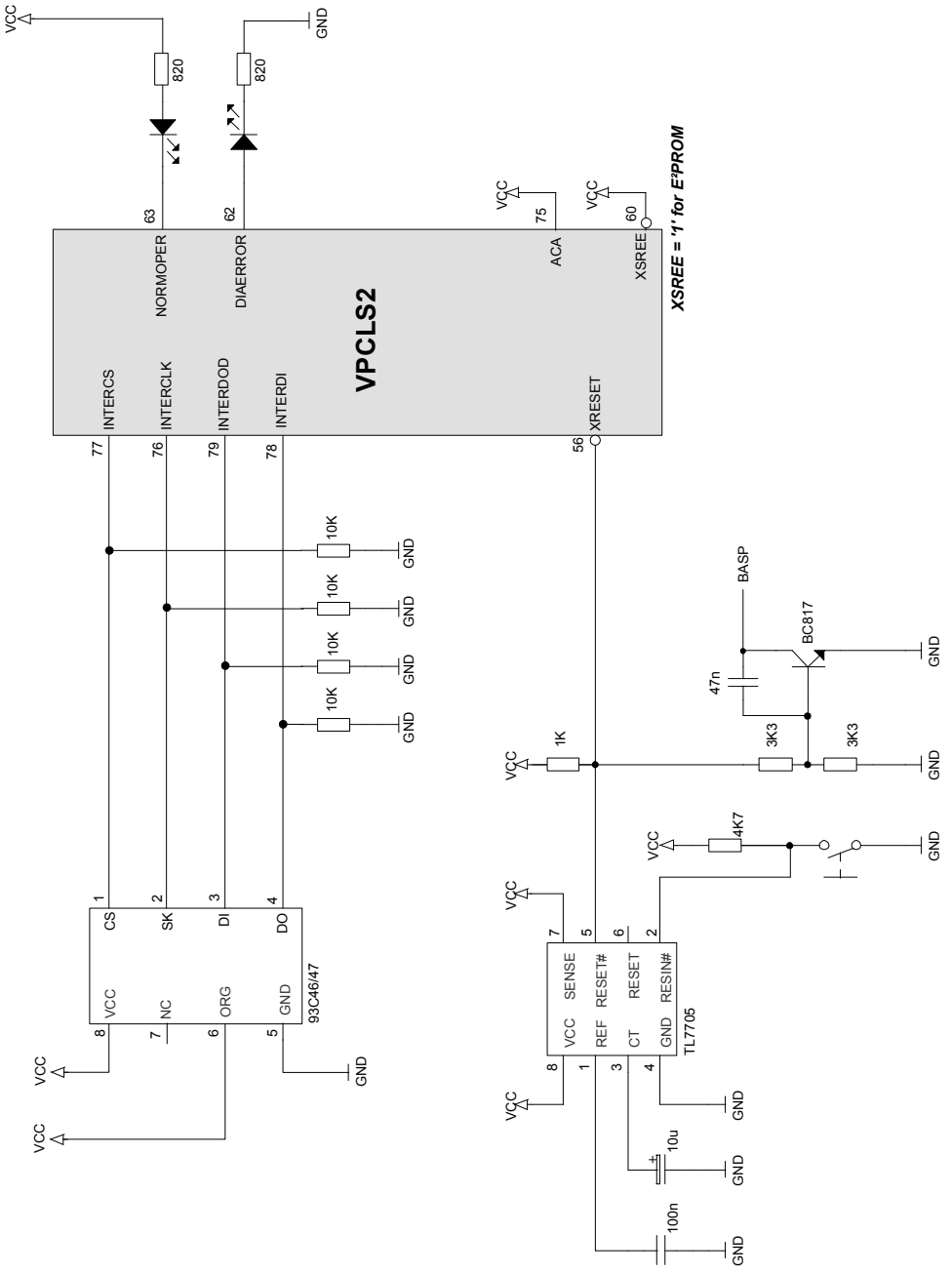

Figure 6-2: E²PROM Example

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6.3 UART

The transmitter converts the parallel data structure into a serial data flow. Signal Request-to-Send (RTS) is generated before the first character. The XCTS input is available for connecting a modem. After RTS active, the transmitter must hold back the first telegram character until the modem activates XCTS. XCTS is checked again after each character.

The receiver converts the serial data flow into the parallel data structure and scans the serial data flow with the four-fold transmission speed. Stop bit testing can be switched off for test purposes ('Dis_Stop_Control = 1' in mode register 0 or Set_Prm telegram for DP). One requirement of the PROFIBUS protocol is that no rest states are permitted between the telegram characters. The VPCLS2 transmitter ensures that this specification is maintained.

The synchronization of the receiver starts with the falling edge of the Start bit. The Start bit is checked again in the middle of the bit-time for low level. The data bits, the Parity and the Stop bit are also scanned in the middle of the bit-time. To compensate for the synchronization error, a repeater generates a ±25% distortion of the stop bit at a four-fold scan rate. In this case the VPCLS2 should be parameterized with 'Dis_Start_Control = 1' (‘Set_Prm telegram’ for DP) in order to increase the permissible distortion of the stop bit.

6.4 ASIC Test

The XTEMO pin is used to enable internal test modes of the VPCLS2 during production of the chip. All output and I/O pins of VPCLS2 can be switched in the high-resistance state via the XTRI test pin.

Pin	Name	Value	Function
58	XTEMO	GND	test modes enabled
		VCC	test modes disabled (normal operation mode)
59	XTRI	GND	all outputs are high-resistance
		VCC	normal operation mode

Figure 6-3: Test Ports

These inputs must not be left unconnected.

VCC must be applied to the XTEMO and XTRI pin in normal operation mode.

The test modes are for testing the chip on automatic test equipment during chip production only (not in the target hardware environment!). Those test modes are NOT user accessible.

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6 Hardware Interface

Notes:

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7.1 Pin Assignment

The data transmission is performed in RS485 operating mode (i.e., physical RS485). VPCLS2 provides the PROFIBUS interface signals listed in Table below.

Signal Name	I/O	Type	Function
XCTS	I	CMOS	Clear to Send
RXD	I	CMOS	Receive Data
RTS	O	CMOS	Request to Send
TXD	O	CMOS	Transmit Data

Table 7-1: PROFIBUS Interface Signals

Before transmitting, the VPCLS2 sets the RTS signal to '1' and then loads the transmit buffer of the UART with the first character to be transmitted. The UART holds back the first telegram character until signal XCTS is active ('0'). On completion of transmission (transmit buffer is empty and the last stop bit is sent), the RTS signal is de-asserted ('0').

The PROFIBUS interface is a 9-way, sub D, plug connector with the following pin assignment.

Pin 1 - Free
Pin 2 - Free
Pin 3 - B line
Pin 4 - Request to send (RTS)
Pin 5 - Ground 5V (M 5)
Pin 6 - Potential 5V (floating P5)
Pin 7 - Free
Pin 8 - A line
Pin 9 - Free

The cable shield must be connected to the plug connector housing.
The free pins are described as optional in IEC 61158-2.

CAUTION:
The pin names A and B on the plug connector refer to the signal names in the RS485 standard and not the pin names of driver ICs.

Keep the wires from driver to connector as short as possible.

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7.2 Example for the RS485 Interface

To minimize the capacity of the bus lines the user should avoid additional capacities. The typical capacity of a bus station should be 15...25 pF.

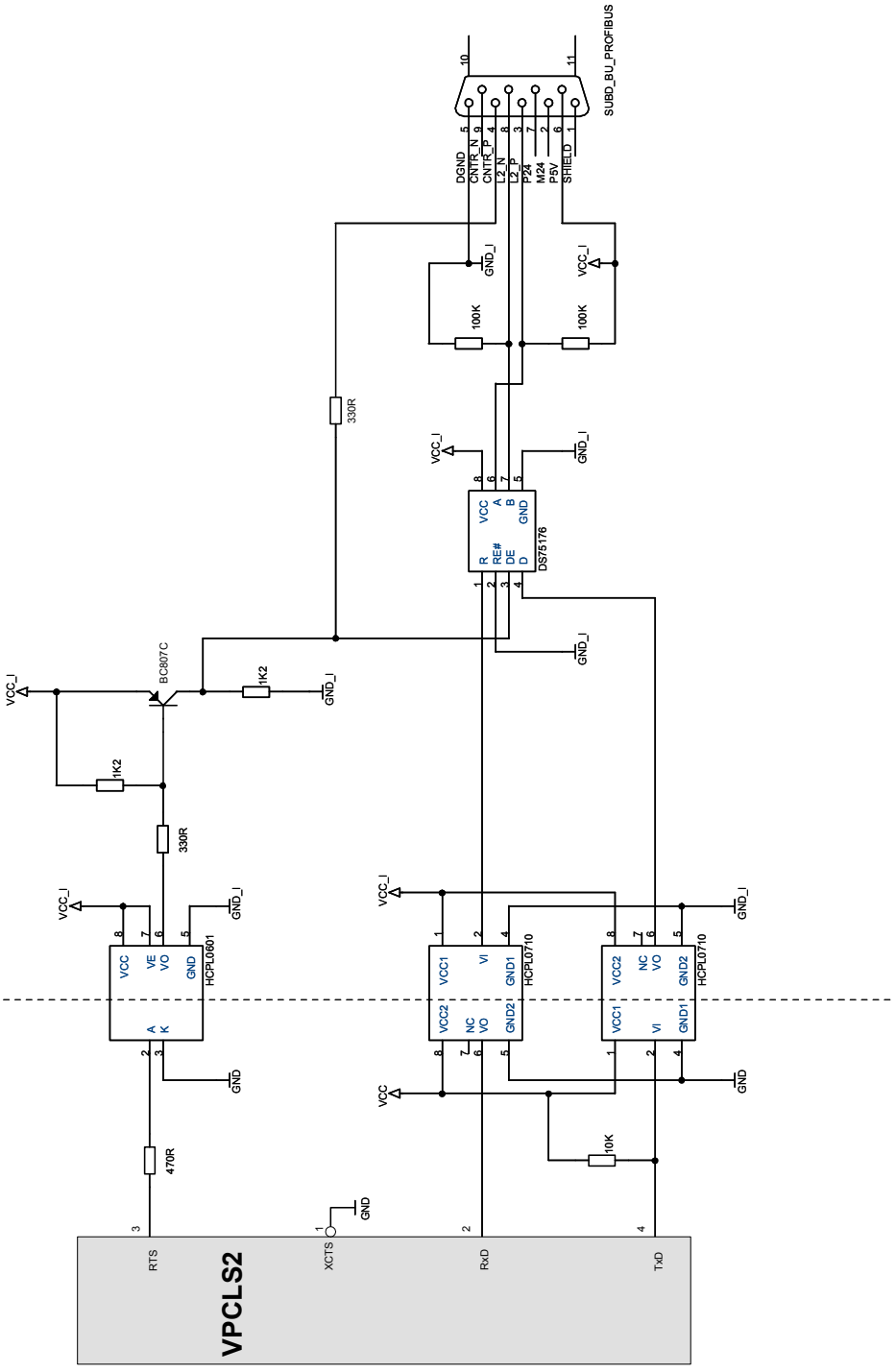

Figure 7-1 : Example for RS485 Interface

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8.1 Absolute Maximum Ratings

The VPCLS2 contains protective circuitry against damage due to high static voltages or electrical fields; however, it is highly recommended to preserve all standard precautions in order to avoid application of any voltages higher than maximum-rated voltages to this circuit.

SYMBOL	PARAMETER	RATING	UNITS
V_{CC}	DC Power Supply Voltage	-0.3 to 6.0	V
V_{IN}	Input Voltage	-0.3 to V_{CC}+0.3	V
V_{OUT}	Output Voltage	-0.3 to V_{CC}+0.3	V
I_{OUT}	DC Output Current	See Table 8-4	mA
T_{STG}	Storage Temperature	-40 to 150	°C
$R_{\Theta(JA)}$	R_{Θ} Junction-Ambient (still air)	43.8	°C/W

Table 8-1 : Absolute Maximum Ratings

Long-term operation using maximum ratings will reduce the lifetime of the device.

8.2 Current Consumption

SYMBOL	PARAMETER	CONDITION	LIMITS	UNITS
I_A	Current Consumption	12MBit/s transmission rate, state WAIT_PRM, no bus traffic	65	mA
I_A	Current Consumption	12MBit/s transmission rate, all ports configured as outputs and driven active high	150	mA

Figure 8-1 : Current Consumption of VPCLS2

8.3 Recommended Operating Conditions

SYMBOL	PARAMETER	MIN	TYP	MAX	UNITS
V_{CC}	DC Power Supply Voltage	4.50	5.00	5.50	V
GND	Circuit Ground	0	0	0	V
V_{IN}	Input Voltage	0		V_{CC}	V
T_J	Junction Operating Temperature	-40		125	°C
T_A	Ambient Temperature	-40	25	85	°C

Table 8-2 : Operating Conditions

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8.4 DC Electrical Characteristics Specification of I/O cells

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
V_{CC}	DC Power Supply Voltage		4.50	5.00	5.50	V
V_{IL}	Input Low Voltage	CMOS			$0.3 \times V_{CC}$	V
V_{IH}	Input High Voltage		$0.7 \times V_{CC}$			V
V_{IL}	Input Low Voltage	TTL			0.8	V
V_{IH}	Input High Voltage		2.0			V
V_T	Switching Threshold	CMOS		2.4		V
		TTL		1.4		V
V_{T-}	Schmitt Trigger Negative Going Threshold Voltage	CMOS	1.5	1.8		V
V_{T+}	Schmitt Trigger Positive Going Threshold Voltage			3.0	3.4	V
V_{T-}	Schmitt Trigger Negative Going Threshold Voltage	TTL	0.9	1.1		V
V_{T+}	Schmitt Trigger Positive Going Threshold Voltage			1.8	2.1	V
V_{OL}	Output Low Voltage	I_{OL} = 2 ~24 mA			0.4	V
V_{OH}	Output High Voltage	I_{OH} = -2 ~ -24 mA	3.5			V
I_{IN}	Input Leakage Current	$V_{IN} = V_{CC}$ or 0	-10	±1	10	µA
I_{OZ}	3-State Output Leakage Current		-10	±1	10	µA
C_{IN}	Input Capacitance			3	5	pF
C_{OUT}	Output Capacitance			3.5	5	pF
C_{BID}	Bi-directional Buffer Capacitance			3.5	5	pF

Table 8-3 : DC Characteristics of I/O cells

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SIGNAL	DRIVER TYPE	DRIVER STRENGTH	MAX. CAP. LOAD
PA[7..0] to PD[7..0]	Tristate	4 mA	50 pF
TXD	Tristate	8 mA	50 pF
RTS	Tristate	8 mA	50 pF
NORMOPER	Tristate	4 mA	50 pF
DIAERROR	Tristate	4 mA	50 pF
INTERCLK	Tristate	4 mA	50 pF
INTERCS	Tristate	4 mA	50 pF
INTERDOD	Tristate	4 mA	50 pF
RWCONS	Tristate	4 mA	50 pF

Table 8-4 : Ratings of the Output Drivers

8.5 Signal Summary

8.5.1 Bidirectional Signals

BIDIRECTIONAL SIGNALS	QTY.	I/O	TYPE
PA[7...0]	8	I/O	CMOS Schmitt Trigger, 4 mA Buffer
PB[7...0]	8	I/O	CMOS Schmitt Trigger, 4 mA Buffer
PC[7...0]	8	I/O	CMOS Schmitt Trigger, 4 mA Buffer
PD[7...0]	8	I/O	CMOS Schmitt Trigger, 4 mA Buffer

Table 8-5 : Bidirectional Signals of VPCLS2

8.5.2 Inputs

INPUTS	QTY.	I/O	TYPE
ACA	1	IN	CMOS
PE[7..0]	8	IN	CMOS Schmitt Trigger
INTERDI	1	IN	TTL Schmitt Trigger
RXD	1	IN	CMOS Schmitt Trigger
XTEMO	1	IN	CMOS
XTRI	1	IN	CMOS
XSREE	1	IN	CMOS
TYP[4..0]	5	IN	CMOS
CTS	1	IN	CMOS Schmitt Trigger
XRESET	1	IN	CMOS Schmitt Trigger
CLK	1	IN	TTL Schmitt Trigger

Table 8-6 : Inputs of VPCLS2

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8.5.3 Outputs

OUTPUTS	QTY.	I/O	TYPE
DIAERROR	1	OUT	4 mA Buffer
INTERCS	1	OUT	4 mA Buffer
NORMOPER	1	OUT	4 mA Buffer
RWCONS	1	OUT	4 mA Buffer
RTS	1	OUT	8 mA Buffer
TXD	1	OUT	8 mA Buffer

Table 8-7 : Outputs of VPCLS2

8.5.4 Power Supply

POWER SUPPLY	VCC	GND
	7	9

Table 8-8 : Power Supply of VPCLS2

8.6 Timing Characteristics

8.6.1 Shift Register Interface

The Shift Register control logic switches the signals to the pins with the trailing edge.

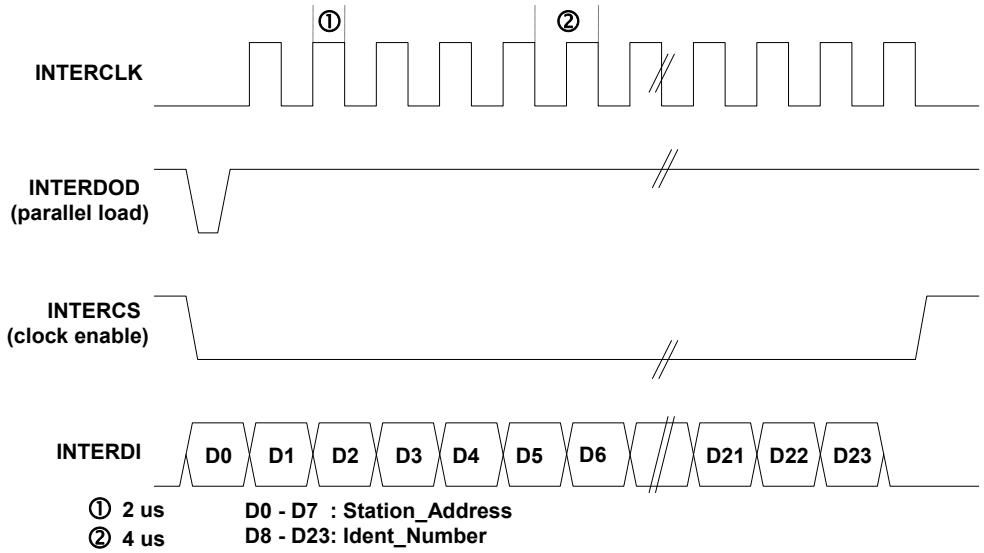

Figure 8-2: Shift Register read cycle

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8.6.2 RESET

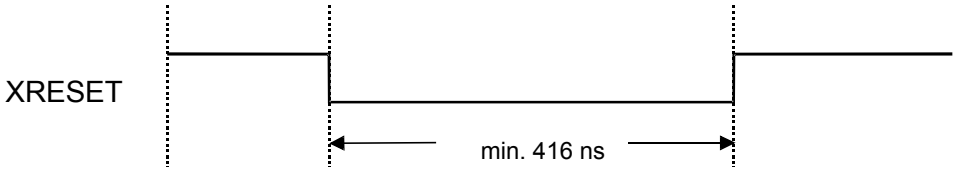

Figure 8-3 : RESET Timing

8.6.3 E²PROM Interface

The E²PROM control logic switches the signals to the pins with the trailing edge.

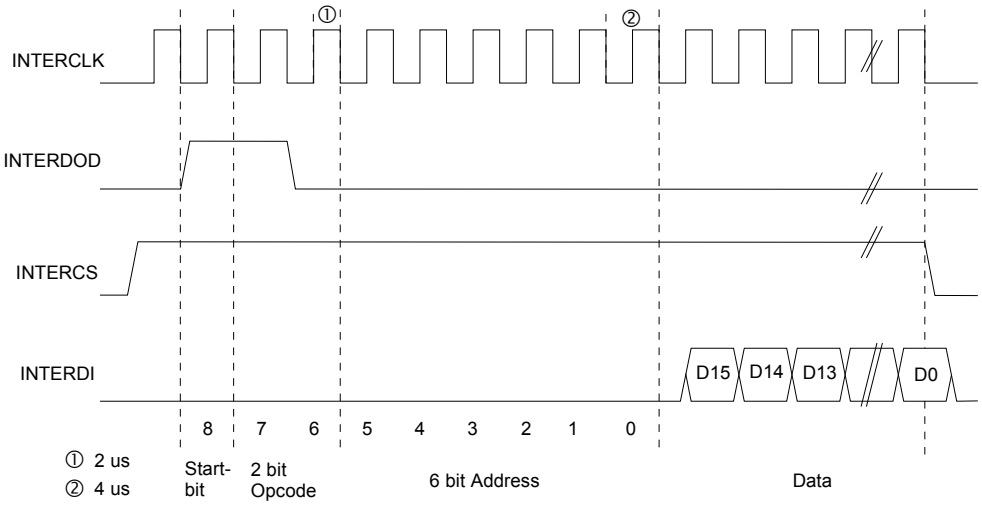

Figure 8-4: E²PROM read cycle for address 0

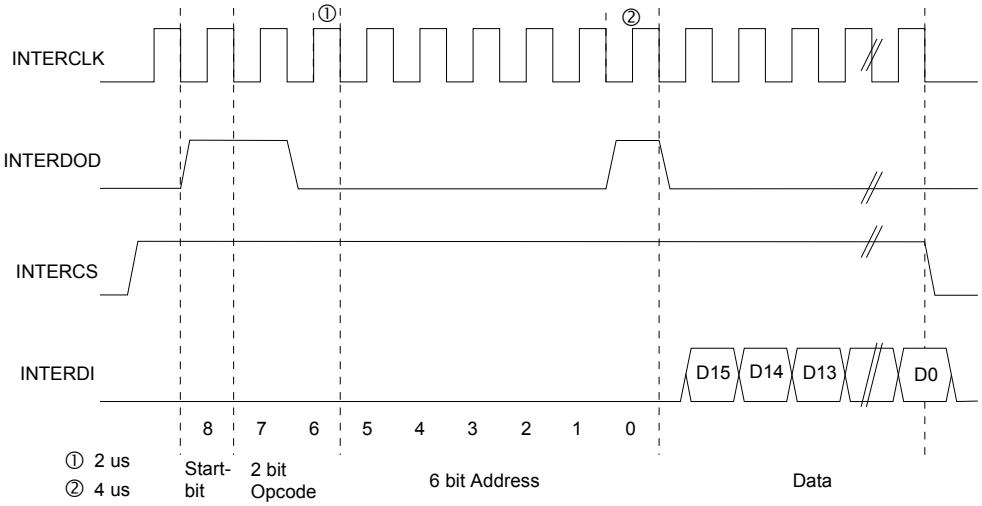

Figure 8-5: E²PROM read cycle for address 1

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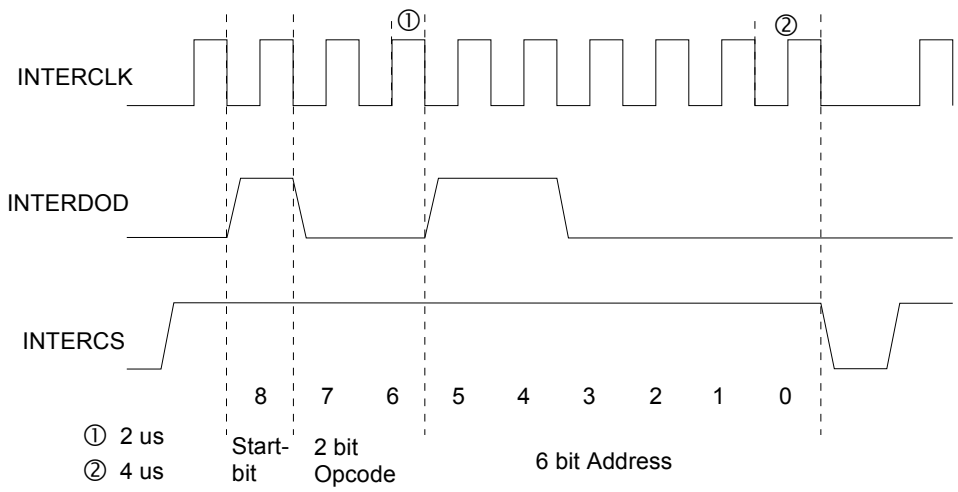

Figure 8-6: E²PROM erase / write enable cycle

After erase / write enable cycle the write cycle follows immediately.

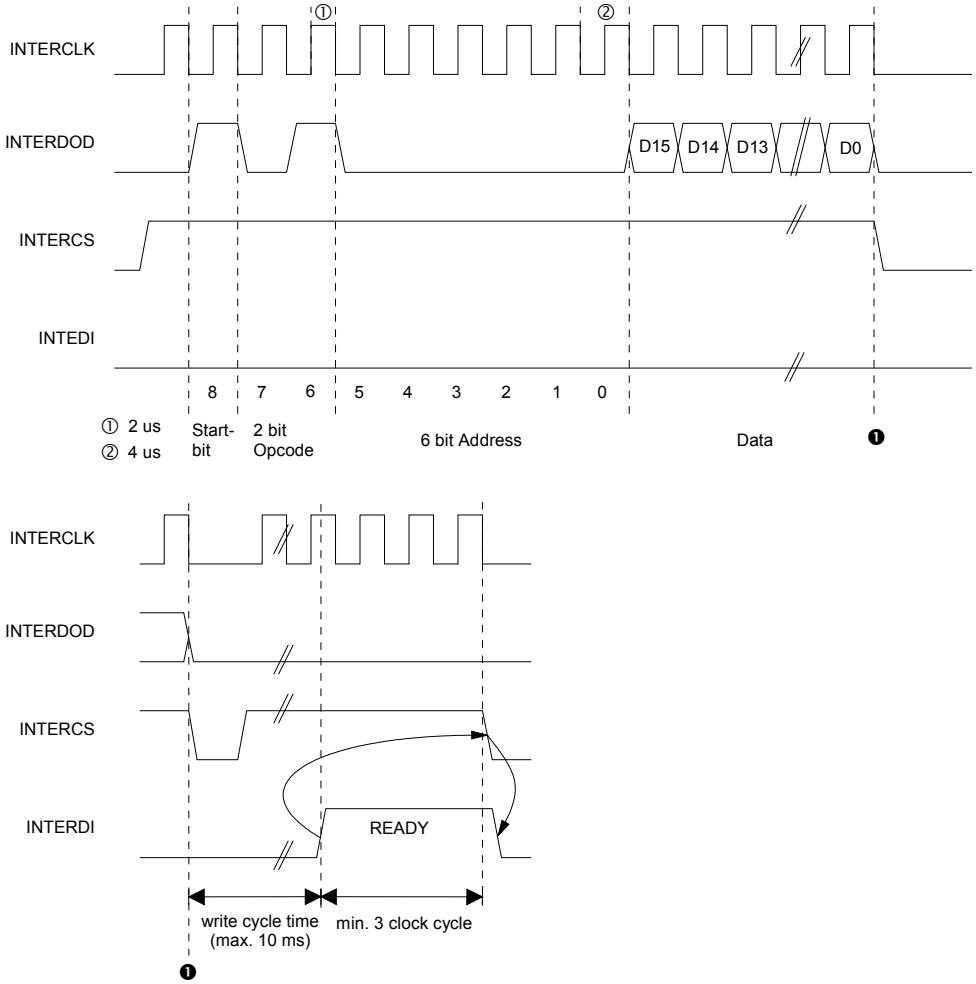

Figure 8-7: E²PROM write cycle

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8.6.4 Consistency Signal RWCONS

Write timing: The user can switch external latches transparently with the RWCONS signal in order to accept new data from the output ports simultaneously.

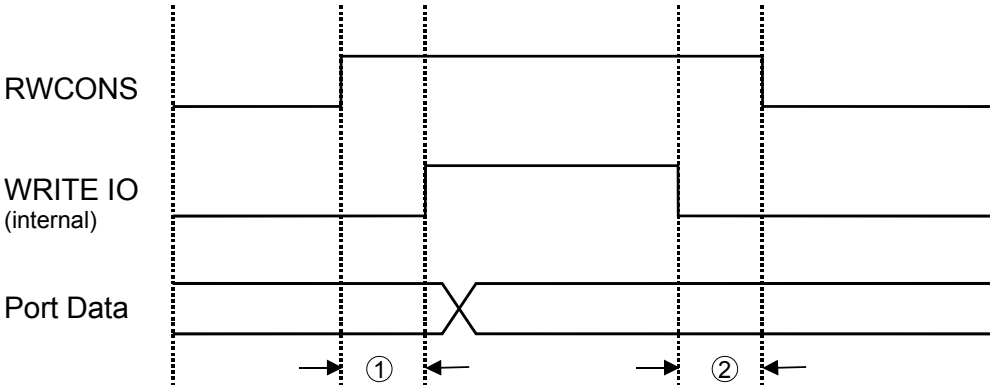

Figure 8-8 : RWCONS WRITE cycle

Read timing: The user can freeze external latches with the RWCONS signal in order to accept consistent data at the input ports of the VPCLS2 ("snapshot" option).

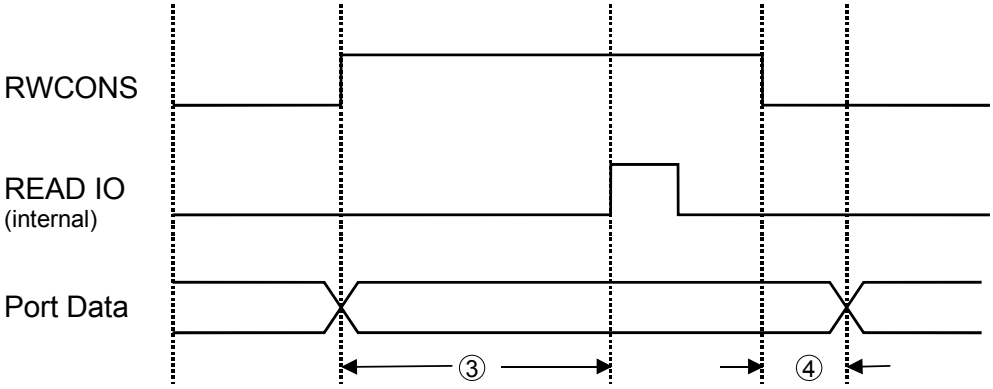

Figure 8-9 : RWCONS READ cycle

No.	Symbol	Parameter		Unit
1	RWCONS $_{SETUP}$	RWCONS active to internal write	1	Tbit*
2	RWCONS $_{HOLD}$	RWCONS inactive to internal write	1	Tbit*
3	D $_{SETUP}$	Data – Setup after RWCONS active	1	Tbit*
4	D $_{HOLD}$	Data – Hold after RWCONS inactive	0	Tbit*

*: 1 Tbit =104µs at 9,6kBd , 1 Tbit = 83ns at 12MBd

Table 8-9 : RWCONS Timing

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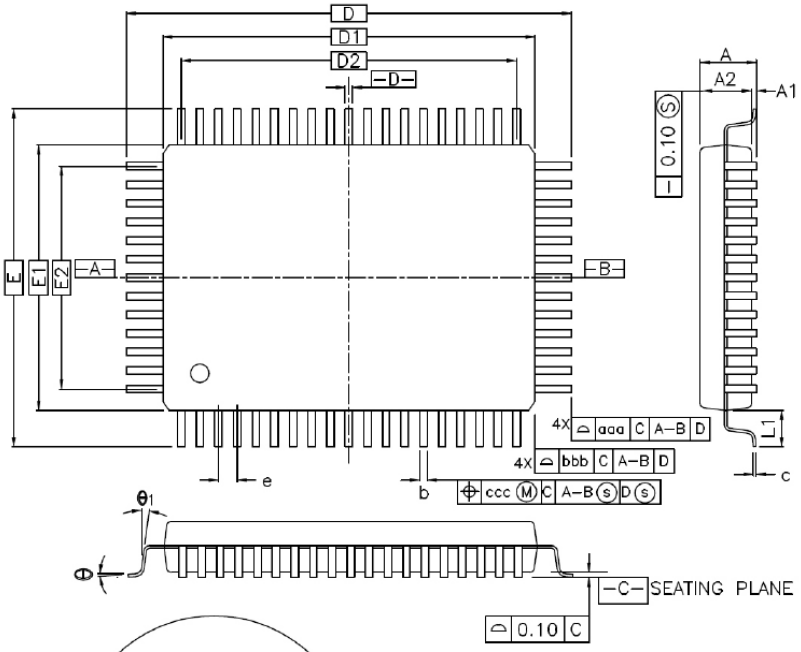
8.7 Package

The package of the VPCLS2 is lead-free.



COTROL DIMENSIONS ARE IN MILLIMETERS.

SYMBOL	MILLIMETER			INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	—	—	3.40	—	—	0.134
A1	0.15	0.25	0.35	0.006	0.010	0.014
A2	2.55	2.72	3.05	0.100	0.107	0.120
D	23.60 BASIC			0.929 BASIC		
D1	20.00 BASIC			0.787 BASIC		
E	17.60 BASIC			0.693 BASIC		
E1	14.00 BASIC			0.551 BASIC		
R2	0.13	—	0.30	0.005	—	0.012
R1	0.13	—	—	0.005	—	—
θ	0°	3.5°	7°	0°	3.5°	7°
θ1	0°	—	—	0°	—	—
θ2 ,θ3	15° REF			15° REF		
c	0.11	0.15	0.23	0.004	0.006	0.009
L	0.60	0.75	0.90	0.024	0.030	0.035
L1	1.80 REF			0.071 REF		
S	0.40	—	—	0.016	—	—

SYMBOL	MILLIMETER			INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
b	0.30	0.35	0.45	0.012	0.014	0.018
e	0.80 BSC.			0.031 BSC.		
D2	18.40 REF			0.724		
E2	12.00 REF			0.472		
TOLERANCES OF FORM AND POSITION						
aaa	0.25			0.010		
bbb	0.20			0.008		
ccc	0.20			0.008		

NOTES :

1. DIMENSION D1 AND E1 DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE PROTRUSION IS 0.25mm PER SIDE. DIMENSIONS D1 AND E1 DO INCLUDE MOLD MISMATCH AND ARE DETERMINED AT DATUM PLANE -H-

2. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL NOT CAUSE THE LEAD WIDTH TO EXCEED. THE MAXIMUM b DIMENSION BY MORE THAN 0.08 mm. DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OR THE LEAD FOOT.

Figure 8-10 : Package Drawing

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8.8 Processing Instructions

8.8.1 ESD Protection

The ESD safety standards have to be preserved for all electronic components at any time.

The VPCLS2 contains protective circuitry against damage due to high static voltages or electrical fields; however, it is highly recommended to preserve all standard precautions in order to avoid application of any voltages higher than maximum-rated voltages to this circuit.

8.8.2 Soldering Pre-Conditioning

All PQFP components are subject to the risk of cracking and must be handled accordingly.

The VPCLS2 must be dried before processing for 24 hours at 125°C and then processed within a period of 48 hours. This drying process may be carried out only once due to preserve solderability of the component. Please ensure that the pins of the VPCLS2 are not bent. Proper processing can be guaranteed only if the deviation from flatness is less than 0.1 mm.

8.8.3 Reflow Soldering Profile

Please see Table 8-10 and Figure 8-11 for details about the lead-free package reflow soldering conditions.

Profile Feature	Description
Average ramp-up rate	1.7~2.3 ℃/sec (Root temperature to 130 ℃)
Preheat -Temperature Minimum -Temperature Maximum -Time(min to max)	 130℃ 183℃ 90~120 sec
Time maintained above: -Temperature -Time	 220 ℃ 80~120 sec
Peak Temperature	260 ℃ / -5 ℃
Time within 5□ of actual peak temperature	10~30 sec
Ramp-down rate	4 ℃/sec (max)
Time 25 °C to peak temperature	8 min (max)

Table 8-10 : Reflow Soldering Conditions

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8 Operational Specifications

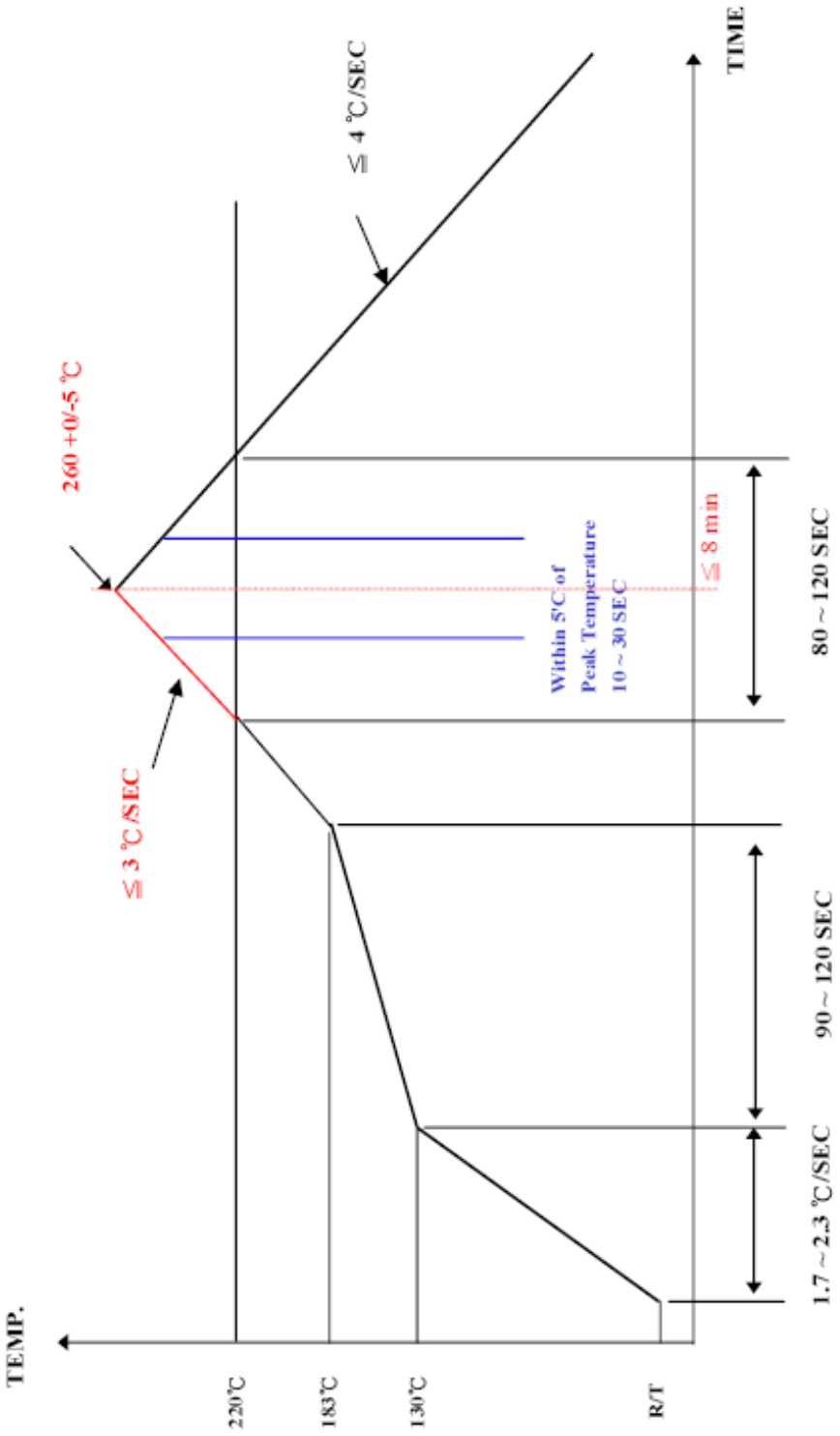

Figure 8-11 : Reflow Soldering Profile

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GSD-File Example 9

```
;=============================================================
; Sample GSD-file for PB systems using VPCLS2
;=============================================================
#PROFIBUS_DP

; <Unit-Definition-List>
GSD_Revision=1
Vendor_Name="Sample GmbH"
Model_Name="XYZ1000"
Revision="V1.0"
Ident_Number=0x1234
Protocol_Ident=0
Station_Type=0
Hardware_Release="1.0"
Software_Release="1.0"
9.6_supp=1
19.2_supp=1
45.45_supp=1
93.75_supp=1
187.5_supp=1
500_supp=1
1.5M_supp=1
3M_supp=1
6M_supp=1
12M_supp=1
MaxTsdr_9.6=60
MaxTsdr_19.2=60
MaxTsdr_45.45=250
MaxTsdr_93.75=60
MaxTsdr_187.5=60
MaxTsdr_500=100
MaxTsdr_1.5M=150
MaxTsdr_3M=250
MaxTsdr_6M=450
MaxTsdr_12M=800
Implementation_Type="VPCLS2"
Bitmap_Device="XYZxxxx"

; Slave-Specification:
OrderNumber="XYZ1000-0AH5-Y0"
Periphery="XYZ"
OffsetFirstMPDBlock=0
ETERDelay=0
MaxResponseDelay=0
Sync_Mode_supp=1
Auto_Baud_supp=1
Min_Slave_Intervall=0
Max_Diag_Data_Len=13
Modul_Offset=0
Slave_Family=1@TdF@XYZ
Max_Module=2
Max_Input_Len=0
Max_Output_Len=2
Max_Data_Len=2
```


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9 GSD-File Example

```
; UserPrmData: Length and Preset:
User_Prm_Data_Len=5
User_Prm_Data = 0x00,0x00,0x00,0x00,0x00
Ext_User_Prm_Data_Const(0)=0x00,0x00,0x00,0x00,0x00

; Unit-Diagnostics:
Unit_Diag_Bit(0000)="short circuit  Ch 0- 7"
Unit_Diag_Bit(0001)="overload       Ch 0- 7"
Unit_Diag_Bit(0002)="short circuit  Ch 8-15"
Unit_Diag_Bit(0003)="overload       Ch 8-15"

; <Module-Definition-List>
Module="2 Byte Out, 0 Byte In" 0x21,0x00
EndModule
```


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Revision History

Version	Date	Page	Remarks
V1.00	22.06.2005		First Release
V1.01	31.01.2007	10	Wrong signal name for pin 45 corrected.
V1.02	04.10.2007	11	Wrong signal name for pin 80 corrected.
V1.03	17.11.2008	44	Minor changes in package dimensions (L_1)

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